

DEC 07 2006

Atty Docket No. 022152-000700US

PTO FAX NO.: 1-571-273-8300

ATTENTION: Examiner Rhonda L. Murphy

Group Art Unit 2616

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**CERTIFICATION OF FACSIMILE TRANSMISSION**

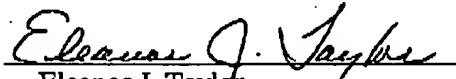
I hereby certify that the following documents in re Application of CHAOJUN, DENG, Application No. 09/827,127, filed April 5, 2001 for SMOOTH CAPACITY EXPANSION METHOD AND SYSTEM FOR DATA COMMUNICATION PRODUCTS are being facsimile transmitted to the Patent and Trademark Office on the date shown below.

Documents Attached

1. Transmittal Form (1 p)
2. Request for Corrected Filing Receipt (2 pp)
3. Red ink markup copy of Filing Receipt (4 pp)
4. Copy of Application Data Sheet filed July 7, 2006 (3 pp)
5. Copy of certified copy of Chinese Patent Application No. 00122430.1, filed 08/01/2000 (14 pp)
6. This Certification of Facsimile Transmission (1 p)

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Dated: December 7, 2006

  
Eleanor J. Taylor

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60933526 v1

DEC 07 2006

PTO/SB/21 (07-06)

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	09/827,127
	Filing Date	April 5, 2001
	First Named Inventor	Deng, Chaojun
	Art Unit	2616
	Examiner Name	Rhonda L. Murphy
	Attorney Docket Number	022152-000700US
Total Number of Pages in This Submission		

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation <input type="checkbox"/> Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____  <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): •Certification of Facsimile Transmission •Request for Corrected Filing Receipt •Red ink markup copy of Filing Receipt •Copy of Application Data Sheet filed July 7, 2006 •Copy of certified copy of Chinese Patent Application No. 00122430.1
Remarks: The Commissioner is authorized to charge any additional fees to Deposit Account 20-1430.		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Townsend and Townsend and Crew LLP		
Signature	<i>Daniel Mao</i>		
Printed name	Daniel Mao		
Date	December 7, 2006	Reg. No.	51,995

CERTIFICATE OF TRANSMISSION/MAILING			
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PATENT  
Docket No.: 022152-000700US  
Client Ref. No.: HW064

TOWNSEND and TOWNSEND and CREW LLP

By: Eleanor J. Taylor

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

CHAOJUN, DENG

Application No.: 09/827,127

Filed: April 5, 2001

For: SMOOTH CAPACITY  
EXPANSION METHOD AND SYSTEM  
FOR DATA COMMUNICATION  
PRODUCTS

Customer No.: 20350

Confirmation No.: 4908

Examiner: Rhonda L. Murphy

Art Unit: 2616

**REQUEST FOR CORRECTED FILING  
RECEIPT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Attached is a red ink markup copy of the official Filing Receipt received from the Patent and Trademark Office in the above-noted application for which issuance of a corrected filing receipt is respectfully requested.

There is an error in that the filing date of the priority application under the heading "Foreign Applications" is shown incorrectly as "03/08/2000" and should read as follows: "08/01/2000." The listing under the heading "Foreign Applications" should be shown as follows:

**CHINA 00122430.1 08/01/2000**

In support of this Request for Corrected Filing Receipt, see the following attached documents:

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DEC 07 2006

CHAOJUN, DENG  
Application No.: 09/827,127  
Page 2

PATENT

(1) copy of the Application Data Sheet, page 3, submitted with the Amendment on July 7, 2006, in response to Office Action of January 25, 2006; and

(2) copy of the certified copy of Chinese Patent Application No. 00122430.1 filed with the above identified application on April 5, 2001. The certified copy of Chinese Patent Application No. 00122430.1 shows its filing date as "2000 08 01".

Respectfully submitted,



Daniel Mao  
Reg. No. 51,995

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## UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/827,127	04/05/2001	2631	764	43774/209425	4	23	2

CONFIRMATION NO. 4908

000826  
ALSTON & BIRD LLP  
BANK OF AMERICA PLAZA  
101 SOUTH TRYON STREET, SUITE 4000  
CHARLOTTE, NC 28280-4000

## FILING RECEIPT



\*0C000000006128806\*

Date Mailed: 05/30/2001

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Customer Service Center. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

## Applicant(s)

Chaojun Deng, Shenzhen, CHINA;

## Assignment For Published Patent Application

Huawei Technologies Co., Ltd.;

## Domestic Priority data as claimed by applicant

## Foreign Applications

08/01/2000

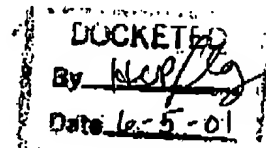
CHINA 00122430.1-03/08/2000

If Required, Foreign Filing License Granted 05/29/2001

Projected Publication Date: 09/13/2001

Non-Publication Request: No

Early Publication Request: No



## Title

Smooth capacity expansion method and system for data communication products

**COPY**

**Preliminary Class**  
375

**Data entry by : TERFA, SEBLE**

**Team : OIPE**

**Date: 05/30/2001**

\*\*\*\*\*

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- The articles such as "a," "an" and "the" are not included as the first words in the title of an application. They are considered to be unnecessary to the understanding of the title.
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- The title may be truncated if it consists of more than 500 characters (letters and spaces combined).
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- If your application was submitted under 37 CFR 1.10, your filing date should be the "date in" found on the Express Mail label. If there is a discrepancy, you should submit a request for a corrected Filing Receipt along with a copy of the Express Mail label showing the "date in."
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Washington, DC 20231

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**COPY****Application Data Sheet****Application Information**

Application number:: 09827127  
Filing Date:: 04/05/01  
Application Type:: Regular  
Subject Matter:: Utility  
Suggested classification::  
Suggested Group Art Unit::  
CD-ROM or CD-R??:  
Number of CD disks::  
Number of copies of CDs::  
Sequence Submission::  
Computer Readable Form (CRF)?::  
Number of copies of CRF::  
Title:: SMOOTH CAPACITY EXPANSION METHOD  
AND SYSTEM FOR DATA COMMUNICATION  
PRODUCTS  
Attorney Docket Number:: 022152-000700US  
Request for Early Publication:: No  
Request for Non-Publication:: No  
Suggested Drawing Figure::  
Total Drawing Sheets:: 4  
Small Entity?:: No  
Latin name::  
Variety denomination name::  
Petition included?:: No  
Petition Type::  
Licensed US Govt. Agency::  
Contract or Grant Numbers One::

**COPY**

Secrecy Order in Parent Appl.: No

**Applicant Information**

Applicant Authority Type:: Inventor  
Primary Citizenship Country:: People's Republic of China  
Status:: Full Capacity  
Given Name:: Chaojun  
Middle Name::  
Family Name:: Deng  
Name Suffix::  
City of Residence:: Shenzhen  
State or Province of Residence::  
Country of Residence:: People's Republic of China  
Street of Mailing Address:: Huawei Service Centre Building, Kefa Road  
Postal Address Line Two:: Science-Based Industrial Park, Nanshen District  
City of Mailing Address:: Shenzhen  
State or Province of mailing address::  
Country of mailing address:: People's Republic of China  
Postal or Zip Code of mailing address:: 518057

**Correspondence Information**Correspondence Customer Number:: 20350**Representative Information**Representative Customer Number:: 20350**Domestic Priority Information**

Application:: Continuity Type:: Parent Application:: Parent Filing Date::

**COPY**

**Foreign Priority Information**

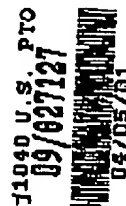
<u>Country::</u>	<u>Application number::</u>	<u>Filing Date::</u>
People's Republic of China	00122430.1	<u>08/01/00</u>

**Assignee Information**

Assignee Name::	Huawei Technologies Co., Ltd.
Street of mailing address::	Science-Based Industrial Park Huawei Service Centre Building, Kefa Road Nanshan District
City of mailing address::	Shenzhen
State or Province of mailing address::	
Country of mailing address::	People's Republic of China
Postal or Zip Code of mailing address::	518057

证

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明



本证明之附件是向本局提交的下列专利申请副本

申 请 日: 2000 08 01

申 请 号: 00 1 22430.1

申 请 类 别: 发明专利

发明创造名称: 可平滑扩容的数据通信系统

申 请 人: 深圳市华为技术有限公司

发明人或设计人: 邓抄军

中华人民共和国  
国家知识产权局局长

姜颖

2001 年 2 月 23 日

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## 权 利 要 求 书

1、一种可平滑扩容的数据通信系统，包括线路卡（10）、交换网板（20），所述线路卡（10）包括处理控制逻辑电路、产品对外接口（1）和线路卡与交换网接口（2），所述交换网板（20）包括交换逻辑电路和交换网板与线路卡接口（3），其特征是：在线路卡与交换网接口（2）和交换网板与线路卡接口（3）之间还有接口转接板（30）、交换网接口板（40）和光纤（50），接口转接板（30）一端与线路卡与交换网接口（2）相连，另一端通过光纤（50）与交换网接口板（40）相连，交换网接口板（40）的另一端与交换网板与线路卡接口（2）相连。

2、如权利要求 1 所述的可平滑扩容的数据通信系统，其特征是：对应每一个交换网板（20）和每一个线路卡（10），均配备一个备用板，当主用板拔出或出现故障或停止工作时，备用板可以代替主用板工作，保持系统连续工作，不中断业务。

3、如权利要求 1 或 2 所述的可平滑扩容的数据通信系统，其特征是：还包括背板（4），线路卡（10）与接口转接板（30）之间的连线、以及交换网板（20）与交换网接口板（40）之间的连线通过背板（4）连接。

4、如权利要求 1 或 2 所述的可平滑扩容的数据通信系统，其特征是：交换网板 20 板单独做在一框内，构成交换网板专用机架，多个线路卡机框通过并行光纤 50 和交换网板专用机架互连。

5、如权利要求 3 所述的可平滑扩容的数据通信系统，其特征是：交换网板 20 板单独做在一框内，构成交换网板 20 专用机架，多个线路卡机框通过并行光纤 50 和交换网板 20 专用机架互连。

6、如权利要求 1 或 2 所述的可平滑扩容的数据通信系统，其特征是：多个接口转接板 30 插在一个板上，而且每个接口转接板 30 可以单独插拔；插在交换网板专用机架的交换网板接口板 40 也采用上面类似结构，即多个交换网板接口板 40 插在一个板上，而且每个交换网板接口板 40 可以单独插拔。

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7、如权利要求 3 所述的可平滑扩容的数据通信系统，其特征是：  
多个接口转接板 30 插在一个板上，而且每个接口转接板 30 可以单独插拔；插在交换网板专用机架的交换网板接口板 40 也采用上面类似结构，即多个交换网板接口板 40 插在一个板上，而且每个交换网板接口板 40 可以单独插拔。

8、如权利要求 4 所述的可平滑扩容的数据通信系统，其特征是：  
多个接口转接板 30 插在一个板上，而且每个接口转接板 30 可以单独插拔；插在交换网板专用机架的交换网板接口板 40 也采用上面类似结构，即多个交换网板接口板 40 插在一个板上，而且每个交换网板接口板 40 可以单独插拔。

9、如权利要求 5 所述的可平滑扩容的数据通信系统，其特征是：  
多个接口转接板 30 插在一个板上，而且每个接口转接板 30 可以单独插拔；插在交换网板专用机架的交换网板接口板 40 也采用上面类似结构，即多个交换网板接口板 40 插在一个板上，而且每个交换网板接口板 40 可以单独插拔。

10、如权利要求 1 或 2 所述的可平滑扩容的数据通信系统，其特征是：线路卡与交换网接口（2）和交换网板与线路卡接口（3）采用相同的接口标准，多对接口采用相同的速率。

# 说明书

## 可平滑扩容的数据通信系统

本发明涉及一种可平滑扩容的数据通信系统，特别是容量为 Gbit、Tbit 的数据通信产品。

目前，市场对于数据通信产品如 ATM 交换机、路由器等的容量要求越来越大，现有的 ATM 交换机、路由器等产品系统结构上主要由线路卡、交换网板和连接线路卡与交换网的背板组成，并且一般是单机架结构。随着容量的扩大，设计产品面临着如下的技术问题：1) 当容量超过百 Gbit 以上时，线路卡（如 POS 接口线路卡、ATM 接口线路卡、Giga-bit 接口线路卡等）很多，整机的功耗较大，单个机架难以实现该产品，特别是 160Gbit 以上容量产品，以目前的技术，单机架做产品还没能解决结构的技术问题，必须采用多机架结构，目前，多机架结构由于跨机架互连、主备等问题，还存在困难，还没有成功的设计。2) 对于不同的数据通信市场，对产品的容量规格要求不同，要求设备供应商必须能提供系列产品，如 10Gbit、40Gbit、80Gbit、160Gbit、320Gbit、640Gbit、1.2T 直到几十 Tbit，目前，各公司不同系列产品的系统结构不同，部分公司在一、两个系列上系统结构可以兼容，但是，在整个系列或从 40Gbit 到 Tbit 整个系列上，还没有一个公司成功设计可平滑扩容的解决方案。3) 目前，由于数据通信的迅速发展，对于容量的要求会越来越大，用户在购买数据通信产品时，是按照需求来购买的，但是，过几年后，通常希望要扩充容量，目前，大部分公司的产品在扩容时，需要购买新一代产品，而且旧产品的决大部分东西不能在新的产品上使用，导致用户扩容升级时，成本投入较多，因此，在扩容时，能最大限度保证用户投资，是具有重要价值的，而对于数据通信产品，线路卡占整个系统硬件成本的 60% 以上，因此在系统升级时，保证线路卡兼容将直接影响用户投资及扩容成本。现有技术达到扩容目的时，往往通过更换产品来解决。即当容量难以满足要求时，通过更换更大容量的产品

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替代小容量产品的方法来解决容量问题。直接导致用户设备的全面升级，升级成本昂贵。

本发明的目的就是为了解决以上问题，提供一种可平滑扩容的数据通信系统，在从几十 Gbit 容量到几百 Gbit 或更大容量间可平滑扩容；同时，在扩容时用户原设备仍可使用，以保护用户投资。

本发明实现上述目的的方案是：一种可平滑扩容的数据通信系统，包括线路卡、交换网板，所述线路卡包括处理控制逻辑电路、产品对外接口和线路卡与交换网接口，所述交换网板包括交换逻辑电路和交换网板与线路卡接口，其特征是：在线路卡与交换网接口和交换网板与线路卡接口之间还有接口转接板、交换网接口板和光纤，接口转接板一端与线路卡与交换网接口相连，另一端通过光纤与交换网接口板相连，交换网接口板的另一端与交换网板与线路卡接口相连。

由于采用了以上的方案，利用接口转接板、交换网接口板和光纤解决了跨框（机架）互连的问题，从而突破了机架空间体积的限制，为扩容提供了可能。在扩容时，原线路卡和交换网板均不需改变，从而保护了用户投资，使升级扩容的成本大大降低。

图 1 是线路卡结构示意图。

图 2 是交换网板结构示意图。

图 3 是单机架结构中交换网板和线路卡互连情况示意图。

图 4 是单机架机械结构外观示意图。

图 5 是本发明连接情况示意图。

图 6 是本发明机械结构外观示意图。

图 7 是底板连接情况示意图。

下面从线路卡结构、单机架结构到多机架结构依次进行描述。其中多机架结构和从单机架结构到多机架结构的扩容方式是本发明的要点。

1) 线路卡 10 结构，如图 1 所示。线路卡 10 包括接口和各种处理控制逻辑，除了线路卡与交换网接口 2 部分需要有约束外，其他地方用户可以根据产品需求自行定义。线路卡与交换网接口 2 的约束见后面描述。

2) 交换网板结构，如图 2 所示。其中，交换网板与线路卡接口 3



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与上面线路卡与交换网板接口 2 互连, 且是相同标准。

3) 交换网板 20 和线路卡 10 互连情况, 如图 3 所示。交换网板 20 有主备两个, 都通过标准接口与线路卡 10 相连, 主备的目的是保证交换网板 20 的可靠性。

交换网板 20 与线路卡 10 通过内部接口标准互连, 该接口为电信号接口, 为了平滑扩容, 该接口必须标准化, 由于在容量比较小时, (如小于 160G), 可以在单机架内设计产品, 因此, 该接口通过背板 4 (Backplane) 互连, 考虑到背板 4 设计难度, 我们方案对于接口信号物理要求如下:

信号传输方式采用高速、串形、差分信号传输方式, 传输速率为 1G 以上, 为了更好地选用接口器件, 建议采用标准接口器件, 如 Fiber Channel(纤维通道)、Gigabit Ethernet(千兆位以太网)、OIF(光接口论坛)、Infiniband(无限带宽)等接口标准。通常速度为: 1Gb/s、1.25Gb/s、1.5Gb/s、2.5Gb/s、3.125Gb/s, 且支持 8B/10B 信号编码, 但是, 对于一个产品只能选用一种速率, 否则, 难以做到平滑扩容。所以, 多个内部接口采用相同同的速率。在容量较大时, 建议选用 2.5Gb/s 速率。

图 3 方案是基本容量方案, 交换网板 20 与线路卡 10 之间通过背板 4 (Backplane) 互连, 交换网板 20 主备各占一个槽位, 每个线路卡 10 占一个槽位。

机械结构大致如图 4 所示, 其中, 线路卡 10 的数量可以根据交换网板 20 的端口数量变化。图 4 中有十六个线路卡 10, 两个交换网板 20, 两个主控板, 交换网板 20 和其他板之间所有信号通过背板 4 互连。(主控板主要功能是用于系统维护、管理, 两个主控板主备使用)。图中 MPU 为主控板, NET 为交换网板单元。

#### 4) 平滑扩容方案

当容量增加时, 需要跨框连接, 但是, 为了不降低系统可靠性, 必须解决好扩容与可靠性的问题。方案如下:

不改变线路卡 10 和背板 4, 改变交换网板 20 板的数量, 并且将交换网板 20 板单独做在一框内, 增加线路卡 10 的数量, 将多个线路卡 10 机框通过并行光纤和交换网板专用机架互连, 同时, 原来的交换网板 20



板槽位，变成与交换网板专用机架互连的接口槽位，具体示意如图 5 所示(4 为背板，50 为光纤)。

该方案中，增加两种板：接口转接板 30 和交换网接口板 40。接口转接板 30 插在原来单机架时交换网板 20 所在槽位，每个线路卡 10 对应一个接口转接板 30，交换网接口板 40 与增加的交换网板 20 在同一机架内，每个线路卡 10 对应一个交换网接口板 40，交换网接口板 40 与接口转接板 30 一一对应。

机械示意图如图 6 所示。

该方案实际上包括线路卡 10 构成的线路卡框和交换网板 20 及交换网接口板 40 构成的接口框，如果要增加容量，只要交换网板 20 容量支持，可以通过增加互连的线路卡框的数目达到平滑增加容量的目的。图中只是画了四个线路卡框，交换网板 20 数量也只有四个，实际上，线路卡框的数量的可以更多，交换网板 20 的数量也可以更多。线路卡框和交换网板 20 的平滑增加就实现了平滑扩容。

可见，本发明由于突破了单机架限制，从而使平滑扩容成为现实。

在本方案中，为了充分利用做到不影响线路卡框的背板 4，需要将接口转接板 30 设计得更为紧凑，由于接口转接板 30 功能简单，器件少，可以做成小板，将多个小板插在一个大板上，而且每个可以单独插拔，可以保证当一个接口转接板 30 更换时，不影响另外一个线路卡 10 的工作，保证在线更换。

其中，底板是无源板，图 7 是底板连接情况示意图。

插在交换网板专用机架的交换网接口板 40 也采用上面类似结构，可以使结构变的更加紧凑。

另外，可以设置备用板，当主用板拔出或出现故障或停止工作时，备用板可以代替主用板工作，保持系统连续工作，不中断业务。这样，在单机架向多机架扩容时，可以先将备用网板拔掉，然后更换接口转接板 30，当更换完毕后，切换到备用板工作，然后再更换主用网板，不需要中断业务。

模拟验证表明，本发明的方案可实现平滑扩容，不需中断业务，性能可靠。

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说明书附图

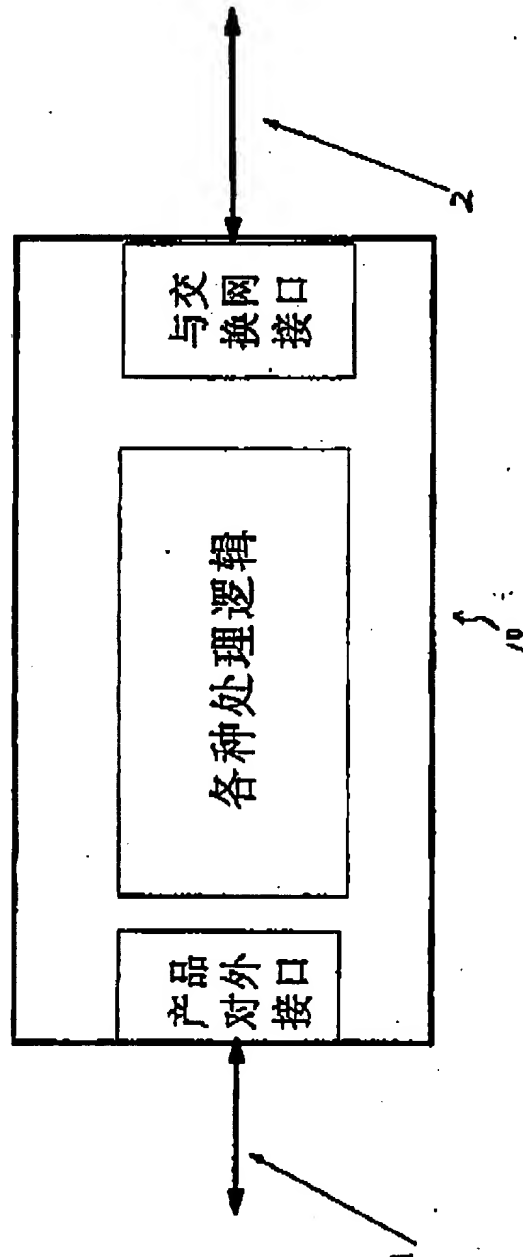
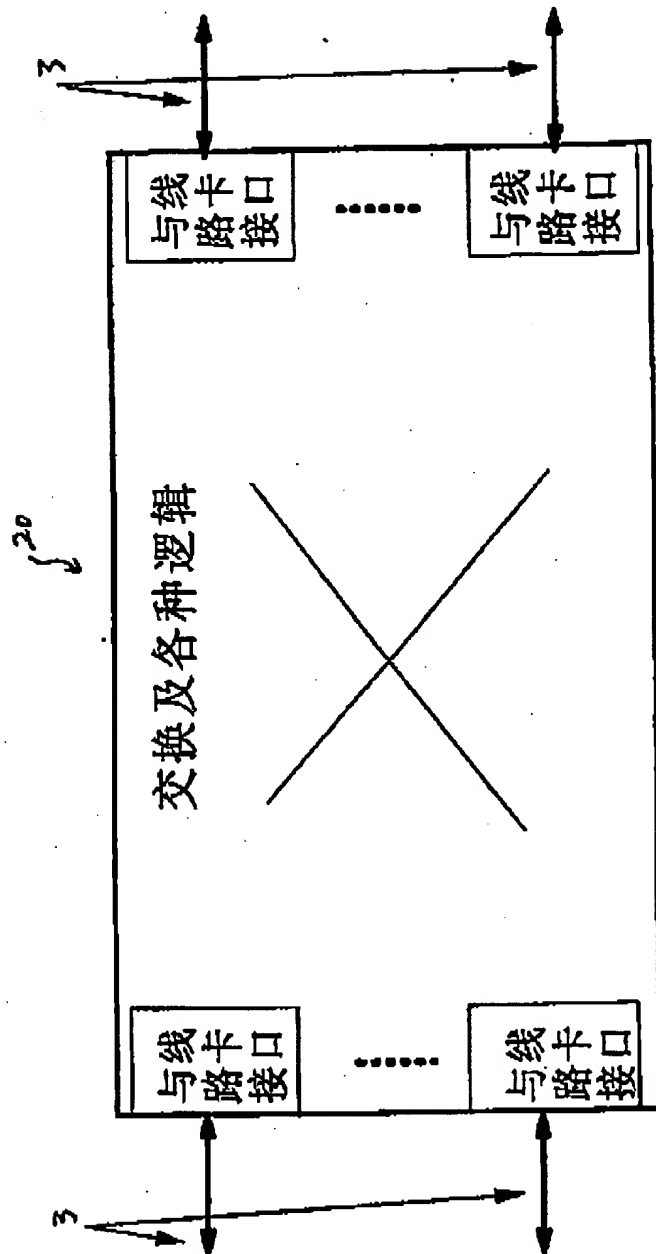


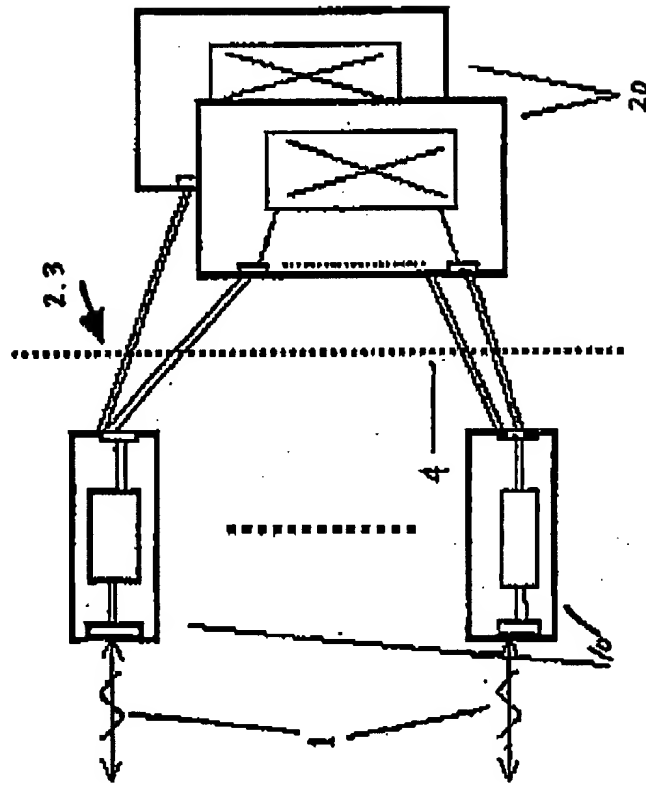
图1

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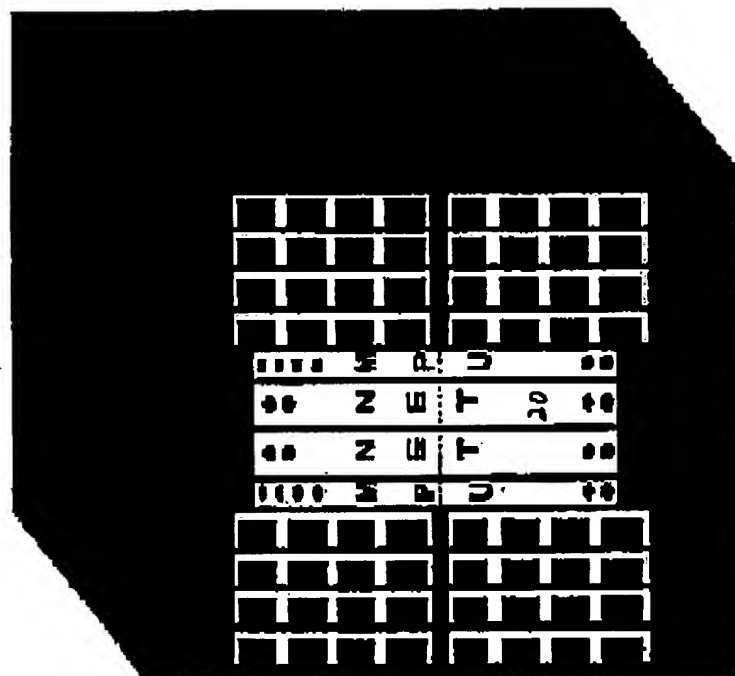
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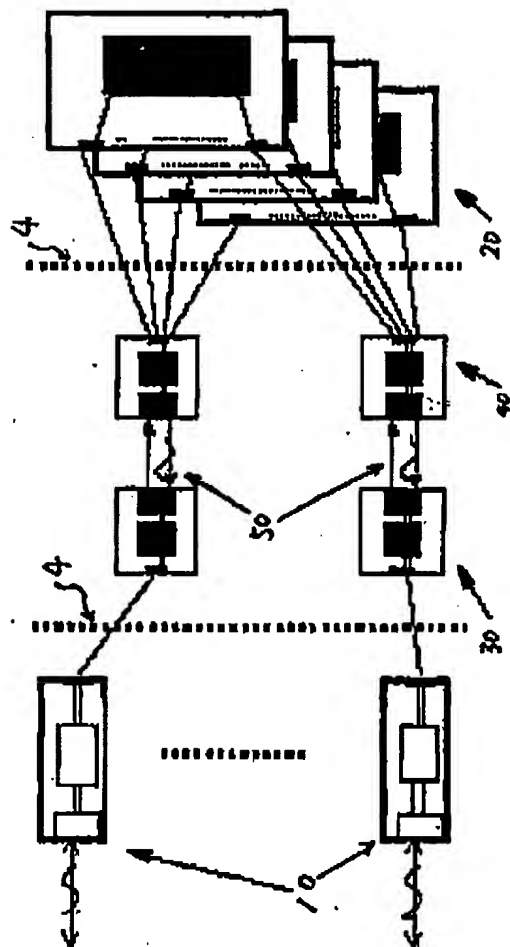
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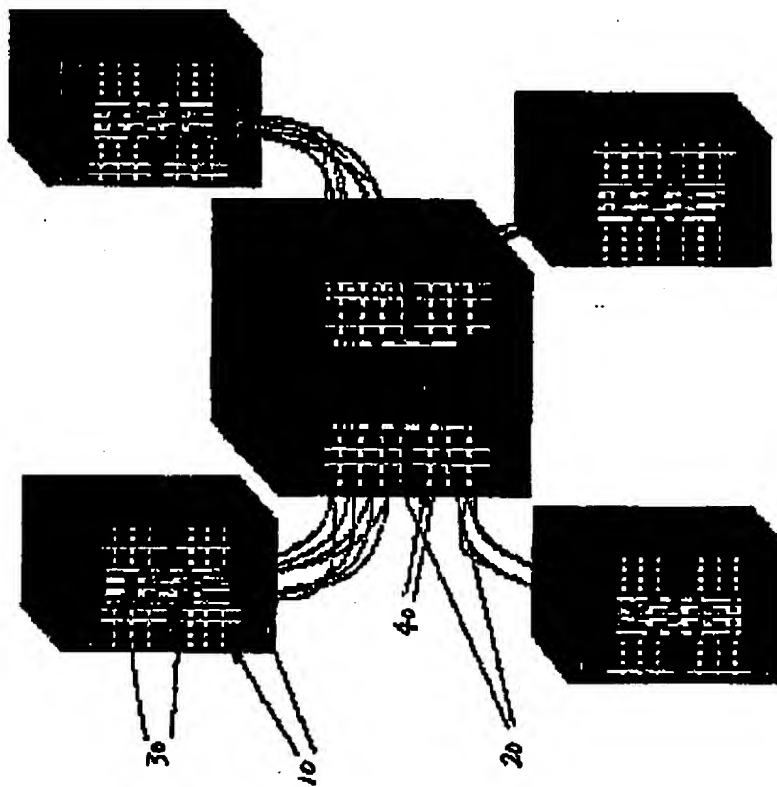


图 6



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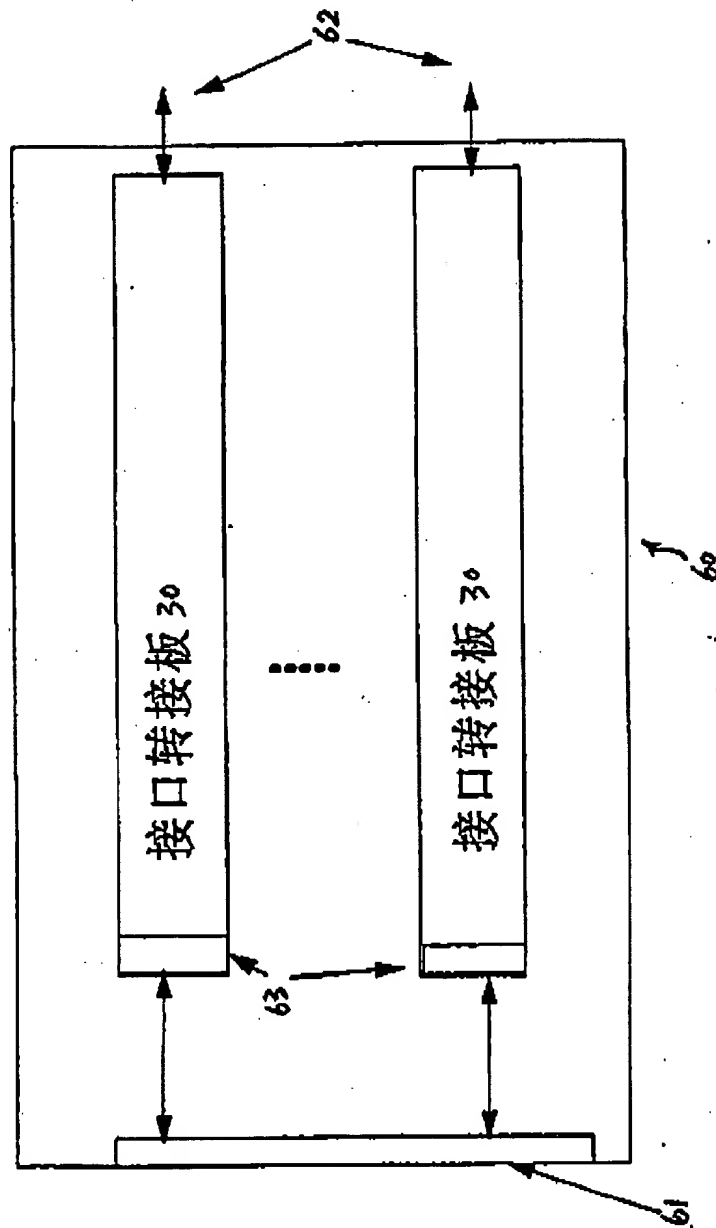


图7